






# VIKRAM RAMAVARAPU

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## RESEARCH INTERESTS

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I am interested in **Network Science (Graphs)** and **Natural Language Processing (NLP)**, particularly applications within **Computational Social Science**, **Social Networks**, **Bioinformatics** and **Computational Biology**.

## EDUCATION

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**University of Illinois Urbana-Champaign (UIUC),**  
**Computer Science** **August 2024 - May 2028 (Expected)**  
Ph.D. in Computer Science

- Advised by Professor George Chacko

**University of Illinois Urbana-Champaign (UIUC),**  
**Bioinformatics** **August 2022 - August 2024**  
Masters of Science in Bioinformatics

**University of Illinois Urbana-Champaign (UIUC)**  
**Mathematics and Computer Science** **August 2019 - May 2022**  
Bachelors of Science in Mathematics and Computer Science

- Graduated with High Distinction

## PUBLICATIONS

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- [Under Review] George Chacko, Minhyuk Park\*, **Vikram Ramavarapu\***, Ananth Grama, Pablo Robles Granda, and Tandy Warnow. “An Agent-Based Model of Citation Behavior” **Applied Network Science (ANS) 2025** [PDF]
- [Also in submission at **Nature Communications**] Mrinmoy S Roddur, **Vikram Ramavarapu**, Abigail Bunkum, Ariana Huebner, Roman Mineyev, Nicholas McGranahan, Simone Zaccaria, Mohammed El-Kebir. “Characterizing the Solution Space of Migration Histories of Metastatic Cancers with MACH2” **Research in Computational Molecular Biology (RECOMB) 2025** [PDF]
- **Vikram Ramavarapu**, Chifumi Nishioka. “Exploration of Multi-Lingual Community Structure in Scholarly Articles” **ACM/IEEE Joint Conference on Digital Libraries (JCDL) 2024** [PDF]
- Minhyuk Park\*, Yasamin Tabatabaee\*, **Vikram Ramavarapu\***, Baqiao Liu, Vidya Kamath Pailodi, Rajiv Ramachandran, Dmitriy Korobskiy, Fabio Ayres, George Chacko, Tandy Warnow. “Well-connectedness and community detection” **PLOS Complex Systems 2024** [HTML]
- **Vikram Ramavarapu**, Fábio Jose Ayres, Minhyuk Park, Vidya Kamath Pailodi, João Alfredo Cardoso Lamy, Tandy Warnow, George Chacko. “CM++-A Meta-Method for Well-Connected Community Detection” **Journal of Open Source Software (JOSS) 2024** [PDF]
- **VP Ramavarapu**, R Sowers, Ramavarapu S Sreenivas. “A smart power outlet for electric devices that can benefit from Real-Time Pricing” **International Conference on Control, Electronics, Renewable Energy and Communications (ICCREC) 2017** [PDF]

## WORK HISTORY

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**Graduate Teaching Assistant, CS411 Database Systems @ UIUC** **Aug. 2025 – Dec. 2025**

- Gave a lecture on front-end/back-end web development with **NextJS/TypeScript**, focused mainly on how to interface a web application with a database. Delivered to a lecture of about 500 students.
- Designed homework assignments for students learning **SQL, MongoDB, and Neo4j/Cypher**.

- Held office hours and answered queries both online and in lecture.

**Research Intern**, National Institute of Informatics, Tokyo, Japan

**Mar. 2024 – Jul. 2024**

- Assembled a citation network dataset tagged by language and field of study (inferred from the title and abstract using **langdetect** and **mBERT** with a classification head) in order to study the network dynamics involved with cross-lingual citation.
- Deployed **Leiden graph clustering in Python: iGraph/Networkit** to examine patterns and community structure in cross-lingual citations. Moreover, to understand how cross-lingual citation can divide a citation network into communities.
- Conducted literature review on similar analyses of multilinguality in science through a computational lens
- Presented this work in the ACM/IEEE JCDL conference in Hong Kong

**Research Assistant**, El-Kebir Group @ UIUC, Champaign, IL

**Jan. 2023 – Dec. 2024**

- Lead the development of a visual tool that allowed users to explore the solution space of per-patient, inferred cancer metastasis graphs, such that nodes are organs and edges are cancer migration events.
- Created functionality for oncologists and medical professionals to filter through the solution space using their known priors (e.g. known metastases or lack thereof) without needing to know how to code.
- This tool had a developer mode so that researchers trying to experiment with new inference techniques can directly open the interactive visualizer from a **Jupyter Notebook**.
- This tool was developed using **React/HTML/CSS** with the **CytoScape** and **d3.js** libraries. Portability to **Python/Jupyter Notebooks** was done using **Flask**.

**Research and Development Intern**, Uhnder Inc., Champaign, IL

**Apr. 2022 – Jan. 2023**

- Designed virtual simulations, on **CARLA** in **Unreal Engine**, of self-driving car scenarios and generated frames of vehicle camera/radar footage.
- Developed a Parallel Radar Image processing pipeline in pure **CUDA**. Noise removal and image compression sped up from non-parallel implementation by a factor of  $>100\times$ .
- Formulated an object detection pipeline for self driving cars: Trained **2D U-Net** on 2D rectangular projections of spherical radar data (r, theta, phi) to perform **Semantic Segmentation**. Improved mean IoU by 30% since initial segmentation model's implementation.
- Built a validation pipeline of these self driving car simulators, comparing simulated and real radar images, as well as older and newer simulator generated images.

**Research Assistant**, with Prof. Yuliy Baryshnikov @ UIUC, Champaign, IL

**Aug. 2021 – May. 2022**

- Applied Cyclicity analysis, a **spectral method** which aggregates regional linear time series data to infer how a signal spreads over a medium. (Originally used in neuroscience to map the spread of trauma during a brain injury), to COVID-19 time-series data.
- Used time series data of COVID-19 cases in American states, and Canadian provinces. Isolated by time period to account for different variants. Direction of COVID-19 spread across North America was inferred using Cyclicity analysis.
- Fetched news articles on COVID-19, as well as notices made by the CDC to validate inferences made by the algorithm.

**Data Engineer Intern**, HBO Max, Culver City, CA

**Jan. 2022 – Apr. 2022**

- Designed, implemented and productionalized method to identify potential international pricing abusers of the streaming service.
- Built a scheme to auto-generate the list using an orchestrator, using **Apache Airflow** and **Snowflake**

**Software Engineer Co-op**, Exelon, Chicago, IL

**Aug. 2021 – Dec. 2021**

- Spearheaded entire reactor performance report generation application, given reactor design and identification, to help nuclear engineers get a proper analysis of reactor health.
- Reduced analysis time from a week's worth of manual effort to an hour for over 99% improvement in work efficiency.
- Demoed work on analysis application to the *head of the nuclear engineering team* at Exelon.

**Research and Development Intern**, Inprentus, Champaign, IL

**Jun. 2018 – May 2019**

- Built an application to automatically generate precise statistical product reports from Atomic Force Microscopy (AFM) images of diffraction gratings. Recipients of these reports included NASA and SLAC (Stanford).
- Created macros to identify components of Scanning Electron Microscope (SEM) images of the indentation tools used to create these diffraction gratings.
- Developed material indentation simulations, using a numerical **Partial Differential Equation (PDE)** solver of the mechanical ruling process in manufacturing of diffraction gratings.
- Did a literature review of the material properties to incorporate (e.g. softness and elasticity) when designing the simulator.

## ONGOING RESEARCH PROJECTS

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- Using a **knowledge graph RAG (LLM)** system on a network of papers on CRISPR, linked by citation, to understand its timeline of advancements. More broadly, this methodology can be generalized to other fields of science.
- Synergy of network topological clustering, language embedding, and statistical modeling to understand the sociological basis of community formation.
- Using **High Performance Computing (HPC)** to generate large synthetic networks with a community structure based on the ground truth, modeled on real world social networks.
- Using **network clustering** with **contrastive learning** to inform the understanding of social connotation in **transformer** models. (Course Project)

## STUDENTS MENTORED

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- João Cardoso Alfredo Lamy (2023-present)

## SKILLS

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<b>Deep Learning Tools/Frameworks</b>	PyTorch, Hugging Face, TensorFlow, LangChain, JupyterLab/Colab, Large Language Models (LLMs), Ollama, PyG, Graph Neural Networks (GNNs)
<b>Programming Languages</b>	C++, C, Java, Python, SQL, R, Bash, L <sup>A</sup> T <sub>E</sub> X, TypeScript
<b>HPC Platforms</b>	Amazon EC2, UIUC Research Computing (Delta), NJIT Research Computing (Wulver)
<b>HPC tools</b>	CUDA, OpenMP, Numba, Metal Shader Language (Apple Silicon)
<b>General Tools</b>	Git, Linux, Docker, Slurm, Amazon S3 (AWS), Unreal Engine
<b>IDE</b>	Visual Studio Code, Microsoft Visual Studio, Eclipse, Android Studio
<b>Web Programming</b>	NextJS, Django, React, Javascript, TypeScript, Flask, Bootstrap, d3.js, Plotly, CytoScape, Streamlit
<b>Database</b>	MySQL, SQLite, PostGreSQL, Neo4j, GraphQL, MongoDB, Snowflake, Apache Airflow, Tableau, Looker
<b>Python Packages</b>	Networkit, NetworkX, Pandas, Matplotlib, Selenium, NumPy, SciPy, Scikit-Learn, PyTest, Cartopy
<b>C/C++ Packages and Tools</b>	iGraph, Catch, OpenGL, CMake

## RELEVANT COURSES

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Machine Learning • Natural Language Processing • Probability • Linear Algebra • Statistics • Data Structures • Algorithms • Computer Architecture • Databases • Discrete Math • Differential Equations • Partial Differential Equations • Real Analysis • Graph Theory • Applied Parallel Computing • Algorithmic Genomic Biology • Bioinformatics • Anatomy & Physiology • Deep Learning with Graphs • Advanced Social & Information Networks • Applied Network Analysis • Data Mining • Numerical Methods • Deep Learning • System Programming • Web Programming • Programming Languages & Compilers • Data Visualization

## AWARDS AND ACHIEVEMENTS

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- Runner-up for Best Poster Award – JC DL 2024 Conference in Hong Kong
- Deans List 2019/2020 – Awarded to undergraduates in top 20% standing in their college